CLAIMS:

1.   A method of polarization dependent analyzing an optical signal (6) provided to a
      DUT (10), comprising the steps of:

      splitting the optical signal (6) at least into a first signal part (16, 6a) having an
5   initial first polarization and a second signal part (20, 6b) having an initial second
      polarization,

      coding the first signal part (16, 6a) using a first code (17, code 1) and coding the
      second signal part (20, 6b) using a second code (19, code 2),

      providing the coded signal parts (16, 6a, 20, 6b) to the DUT (10),

10   detecting a DUT-signal (32, 140) coming from the DUT (10) in response to the
      coded signal parts (16, 6a, 20, 6b), and

      determining a first part (a, c) of the DUT-signal (32) corresponding to the first
      signal part (16, 6a) by means of the first code (17, code 1) and determining a
      second part (b, d) of the DUT-signal (32, 140) corresponding to the second signal
15   part (20, 6b) by means of the second code (19, code 2).

2.   The method of claim 1, further comprising the steps of:

      additionally splitting the optical signal (6) into a third signal part (6c) having an
      initial third polarization and a fourth signal part (6d) having an initial fourth
      polarization,

20   coding the third signal part (6c) using a third code (code 3) and coding the fourth
      signal part (6d) using a fourth code (code 4),

      providing the first (16, 6a), the second (20, 6b), the third (6c) and the fourth coded
      signal parts (6d) to the DUT (10),

      detecting a DUT signal (32, 140) coming from the DUT (10) in response to the
25   coded signal parts (16, 6a, 20, 6b, 6c, 6d)) and

      determining a first part (a, c) of the DUT-signal (32, 140) corresponding to the first

signal part (16, 6a) by means of the first code (17, code 1) and determining a second part (b, d) of the DUT-signal (32, 140) corresponding to the second signal (20, 6b) by means of the second code (19, code 2) and determining a third part (c) of the DUT-signal (32, 140) corresponding to the third signal part (6c) by

5   means of the third code (code 3) and determining a fourth part (d) of the DUT-signal (32, 140) corresponding to the fourth signal part (6d) by means of the fourth code (code 4).

3.   The method of claim 1 or any one of the above claims, wherein coding comprises at least one of a group comprising:

10   any manipulation of the signal parts (16, 6a, 20, 6b, 6c, 6d) to unambiguously identify each signal part (16, 6a, 20, 6b, 6c, 6d),

intensity modulating at least one of the signal parts (16, 6a, 20, 6b, 6c, 6d),

using a binary code for at least one of the signal parts (16, 6a, 20, 6b, 6c, 6d).

4.   The method of claims 1 or any one of the above claims,

15   wherein at least one of the applied polarizations (first, second, third, and forth polarizations) is orthogonal with respect to each of the other polarizations.

5.   The method of claim 1 or any one of the above claims,

wherein at least one of the applied codes (17, code 1, code 2, code 3, code 4) is orthogonal with respect to each of the other codes.

20   6.   The method of claim 1 or any one of the above claims, further comprising the steps of:

determining the parts (a, b, c, d) of the DUT-signal (32) by multiplying the DUT-signal (32) with each code.

7.   The method of claim 1 or any one of the above claims, further comprising the

25   steps of:

using the optical signal (6) as a measurement signal (18) of an interferometer

(30), and

superimposing the DUT-signal (32) coming from the DUT (10) with a reference signal (34) of the interferometer (30) before detecting the DUT-signal (32) to provide a resulting superimposed signal (36).

5   8.   The method of claim 7, further comprising the steps of:

splitting the resulting superimposed signal (36) into two, preferably orthogonal, parts (40, 42) and detecting each part (40, 42) separately.

9.   The method of claim 7 or any one of the above claims, further comprising the steps of:

10   providing the reference signal (34) with a delay ($\Delta\tau$) and with a reference code (ref), and

identifying the reference signal (34) by multiplying the reference signal (34) with the reference code (ref).

10.   The method of claim 9, wherein the reference code (code ref) fulfils the following
15   conditions: the product of the reference code (ref) with the first code (17, code 1)   · ·
is orthogonal with the product of the reference code (code ref) with the second code (17, code 2), the first code (17, code 1) and the reference code (code ref) are non-orthogonal and the second code (17, code 2) and the reference code (code ref) are non-orthogonal, and

20   11.   An apparatus for polarization dependent analyzing an optical signal (6) transmitted through a DUT (10), comprising:

a first beam splitter (14, 105) splitting the optical signal (6) into a first signal part (16, 6a) having an initial first polarization and a second signal part (20, 6b) having an initial second polarization,

25   a first modulator (27) coding the first signal part (16, 6a) using a first code (17, code 1),

a second modulator (29) coding the second signal part (20, 6b) using a second

code (17, code 2),

a coupler (35, 135) connected to the modulators (27, 29) reuniting both coded signal parts (16, 6a, 20, 6b, 6c, 6d) and providing both coded signal parts (16, 6a, 20, 6b, 6c, 6d) to the DUT (10),

5   a detector (44, 46) detecting a DUT-signal (32, 140) coming from the DUT (10) in response to the coded signal parts (16, 6a, 20, 6b, 6c, 6d),

a first correlator (52-1, 52-3) determining a first signal part (a, c) of the DUT-signal (32, 140) corresponding to the first signal part (16, 6a) by means of the first code (17, code 1), and

10   a second correlator (52-2, 52-4) determining a second part (b, d) of the DUT-signal (32, 140) corresponding to the second signal part (20, 6b) by means of the second code (17, code 2).

12.   The apparatus of claim 11,

wherein the first beam splitter (14, 105) is designed to additionally split the optical
15   signal (6) into a third signal part (6c) having an initial third polarization and a fourth signal part (6d) having an initial fourth polarization,

and further comprising:

a third modulator (127) coding the third signal part (6c) using a third code (code 3),

20   a fourth modulator (129) coding the fourth signal part (6d) using a fourth code (code 4),

wherein the coupler (35, 135) is additionally connected to the third (127) and the fourth modulator (129) and is designed to reunite the coded signal parts (16, 6a, 20, 6b, 6c, 6d) and to provide the first (16, 6a), the second (20, 6b), the third (6c)
25   and the fourth coded signal parts (6d) to the DUT (10),

a third correlator (52-3) determining a third signal part (c) of the DUT-signal (32, 140) corresponding to the third signal part (6c) by means of the third code (code

3), and

a fourth correlator (52-4) determining a fourth part (d) of the DUT-signal (32, 140) corresponding to the fourth signal part (6d) by means of the fourth code (code 4).

13.   The apparatus of claim 11 or any one of the above claims,

5   wherein coding comprises any manipulation of the signal parts (16, 6a, 20, 6b, 6c, 6d) to unambiguously identify each signal part (16, 6a, 20, 6b, 6c, 6d).

14.   The method of claims 11 or any one of the above claims,

wherein at least one of the applied polarizations (first, second, third, and forth polarizations) is orthogonal with respect to each of the other polarizations.

10   15.   The method of claim 11 or any one of the above claims,

wherein at least one of the applied codes (17, code 1, code 2, code 3, code 4) is orthogonal with respect to each of the other codes.

16.   The apparatus of claim 11 or any one of the above claims, wherein at least one of the modulators (27, 29, 127, 129) is adapted to at least one of the following group
15   comprising:

intensity modulating at least one of the signal parts (16, 6a, 20, 6b, 6c, 6d) to code the signal parts (16, 6a, 20, 6b, 6c, 6d),

using a binary code (code 1, code 2, code 3, code 4) for at least one of the signal parts (16, 6a, 20, 6b, 6c, 6d) to code the signal parts (16, 6a, 20, 6b, 6c, 6d).

20   17.   The apparatus of claim 11 or any one of the above claims,

wherein at least one of the correlators (52-1, 52-2, 52-3, 52-4) is adapted to determine the parts of the DUT-signal (32, 140) by multiplying the DUT-signal (32, 140) with each code (code 1, code 2, code 3, code 4).

18.   The apparatus of claim 11 or any one of the above claims, further comprising:

25   a first coupler (5) for providing the optical signal (6) to a measurement arm (8) for

using the optical signal (6) as a measurement signal (18) of an interferometer (30), and to a reference arm (12) for providing a reference signal (34), and

a second coupler (35) for superimposing the DUT-signal (32) coming from the DUT (10) with the reference signal (34) of the interferometer (30) before detecting the DUT-signal (32) to provide a resulting superimposed signal (36) to the detector (44, 46).

19. The apparatus of claim 11, further comprising:

a second beam splitter (38) for splitting the resulting superimposed signal (36) into two, preferably orthogonal, parts (40, 42), and

a second detector (44) to be able to detect each part (40, 42) separately.

20. The apparatus of claim 11 or any one of the above claims, further comprising:

a delay line (60) in the reference arm (12) for providing the reference signal (34) with a delay ($\Delta\tau$) and with a reference code (code ref), and

a fifth correlator (70) for identifying the reference signal (34) by multiplying the reference signal (34) with the reference code (code ref).

21. The apparatus of claim 11 or any one of the above claims, further comprising:

a fifth modulator (62) prepared to apply the reference code (code ref) to the reference signal (34) which fulfills the following conditions: the product of the reference code (code ref) with the first code (17, code 1) is orthogonal with the product of the reference code (code ref) with the second code (17, code 2), the first code (17, code 1) and the reference code (code ref) are non-orthogonal and the second code (17, code 2) and the reference code (code ref) are non-orthogonal.